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No.	B.D.	R.A. 1900.	Decl. 1900.	Position Angle.	Distance.	Mags.		No. of Nights.	Date. 1909.
	°	h m	° ′	°	″				
734	+52°,1697	18·0	+51 54	163·5	7·59	9·1	9·4	2	·282
735	+50,2017	34·2	+50 41	284·2	3·55	9·5	11·0	2	·349
736	+52,1747	48·1	+52 6	268·2	9·53	8·6	11·9	2	·312
737	+53,1696	14 9·3	+52 58	301·7	3·78	10·2	10·6	3	·339
738	+53,1707	18·8	+52 51	311·0	6·52	8·6	11·8	3	·333
739	+52,1843	58·7	+51 59	155·3	2·50	9·2	9·6	2	·349
740	+54,1739	15 15·9	+53 54	39·2	3·42	8·9	9·4	2	·334
741	+53,1773	17·0	+53 7	230·2	8·64	8·5	10·5	2	·341
742	+54,1767	44·7	+53 56	85·3	3·10	9·0	9·2	2	·346
743	+54,1792	16 2·7	+54 42	6·4	7·02	9·0	12·1	3	·337

Notes.

707.—The measures of the distances of both *comites* are unsatisfactory.

720.—A difficult object from the faintness of the *comes.* Examined on four nights.

728.—*Comes* faint and difficult to measure.

729.—Distance doubtful.

730.—There is no star in the position of B.D. +51°,1785 as given by Argelander. This star agrees with his R.A., but lies 2′ N. of his place.

Observations of helium D_3 absorption in the neighbourhood of Sun-spots in 1908.

By Captain R. A. C. Daunt, D.S.O.

The following observations of D_3 absorption in the neighbourhood of sun-spots were made with the same instruments as in previous years, viz. 3-inch equatorial refractor and Thorp prism-grating spectroscope, 15,100 lines to the inch, the eyepiece usually employed being a Steinheil monocentric 20 mm, giving a power of 52.

There is little to add to the remarks made at the head of the tables in the paper on this subject last year, *Monthly Notices*, June 1908. The tables have been drawn out on the same plan, and the system of numbering the sun-spot groups is the same as previously.

The intermittent nature of the appearance of the dark D_3 absorption-line has again been noted; groups which showed D_3 absorption on some days did not do so on others.

As previously, the D_3 line had a broken, patchy, lumpy appearance in all cases under observation with one exception, viz. group No. 6491 on August 1st., when, in addition to the lumpy, thickened appearance of D_3 in rear of the group, the D_3 line of absorption showed as a fine narrow line running across the group; *vide The Observatory*, September 1908. This is the only occasion I have recorded an observation of D_3 as a fine narrow line. A double reversal of the D_3 line was recorded in the area between groups Nos. 6393 and 6396 on April 4th.

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In every case of observation of the dark D_3 line the C line of hydrogen showed disturbance, and in every case was reversed. The most remarkable disturbance of the C line took place on April 4th., between groups Nos. 6393 and 6396, at the time when D_3 was doubly reversed. In most cases the dark hydrogen flocculi were well seen.

The percentage of sun-spots showing D_3 in absorption is slightly lower in 1908 than in 1907.

The groups 6490, 6491, visible at the end of July and the beginning of August, were the seats of considerable disturbance. In addition to the reversals of D_3 and the bright reversal of the C line, large dark flocculi were seen on the C line, extending all over the regions of disturbance, while D_1, D_2, and the *b* group were greatly twisted and distorted in the neighbourhood of the spots.

TABLE I.

Groups in which D_3 was observed as a dark line.

Greenwich No. of Group.	Type of Group.	Dates on which D_3 was observed as a dark line.	Behaviour of Hydrogen Line C.
**6338 6339	IV$_b$, III	Jan. 4, 9	twisted and reversed
6350	I	,, 18	,, ,,
6356	IV$_a$	,, 29	lumpy and reversed
**6360	III	Feb. 4	lumpy, brilliant reversals
6364	IV	,, 9	lumpy and reversed
6366	III	,, 14, 15	distorted and reversed
6374	III, IV$_e$	,, 25, 27	lumpy and reversed, brilliant reversals on Feb. 27, D_3 very conspicuous
*6377	IV$_b$	Mar. 4	lumpy, brilliant reversals
6381	III	,, 11	distorted, brilliant reversals
6382	I, IV$_b$, I	,, 11, 12, 19, 20	,, ,, ,,
6383	II	,, 19, 20	distorted and reversed
6387 6388	III	,, 19, 20	reversed
6389	IV$_b$	,, 31	bright reversals
6390	III, IV$_b$, II$_a$, IV$_a$	Apr. 6, 7, 11	,, ,,
6391	IV$_b$	,, 4	distorted and reversed
*6393 6396	III$_a$, IV, III, IV$_b$	,, 4, 5, 6, 7, 9, 11, 12	great disturbance, brilliant reversals

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TABLE I.—*continued.*

Greenwich No. of Group.	Type of Group.	Dates on which D_3 was observed as a dark line.	Behaviour of Hydrogen Line C.
6397	I	Apr. 4, 5	bright reversals
6392	II	,, 5, 6, 7, 9	,, ,,
6398	IV$_b$	,, 7	,, ,,
6403	I	,, 11	distorted and reversed
6405	I	,, 23	bright reversals
*6414	III, II	,, 25, 26, 27, May 1	brilliant reversals
6421	I	May 1	reversed
*6416	IV$_a$	,, 7	many reversals
*6424 6425	IV$_c$, I	May 7	bright reversals
6432	I	,, 11	,, ,,
6436	IV$_a$	,, 13	many reversals
6463	I	June 28, 29	bright reversals
6478	III	July 18	pale reversals
6482	I	,, 21	bright reversals
6486	I	,, 21	reversed
6490	III$_a$, III$_b$, V	,, 30, Aug. 1, 2, 3, 5, 6	reversed, brilliant reversals, Aug. 12
*6491	IV$_c$, V, IV$_e$	Aug. 1, 2, 3, 5, 6, 11	brilliant reversals, great distortion, D_3 a fine line, Aug. 1
6494	III	,, 6, 11	reversed
6499	II	,, 14, 15, 16, 17	brilliant reversals
*6510	II, III	,, 27, 30, Sept. 1	distorted, bright reversals
*6511	IV$_b$	,, 30	reversed
**6518	I, III	,, 30, Sept. 1	lumpy and reversed
6549	I	Oct. 12	bright reversals
6564 6565	III$_a$, V	Nov. 8, 9, 12	distorted, brilliant reversals
6568	I	,, 19	reversed
6575	III	Dec. 6	,,

An asterisk before a group number denotes that the group was seen a second time, and successive returns of a group are denoted by two, three, and four asterisks.

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TABLE II.

List of Spot-groups in which the D_3 line was not observed.

Greenwich No.	Type.	Greenwich No.	Type.	Greenwich No.	Type.
6329	I	6406	IV	6501	I
6333	IV$_b$	6407	IV	6502	I
6334	I	6408	I	6503	I
*6335	IV$_a$	6409	I	6504	I
6336	I	6411	I	6507	I
6337	I	6412	I	6512	I
6341	I	6413	I	6513	I
6342	I	6418	IV$_b$	6516	IV
*6344	IV$_a$	*6419	IV$_a$	*6517	IV
6346	I	**6420	IV$_a$	*6535	I
6348	I	6422	I	6537	IV$_b$, IV$_a$
*6349	II$_a$, IV$_b$	6423	I	*6539	IV$_b$
6359	I	6427	I	6541	
*6361	I	6429	I	*6540	IV$_a$, IV$_b$
6367	I	*6430	IV, I	6543	I
*6368	I	6431	I	6547	IV, I
6363	I	*6464	IV$_a$, IV$_b$	6548	I
6370	I	6465	IV$_a$	6550	IV$_a$
6371	I	6466	I	6556	I
6372	IV$_a$, IV$_b$, IV	6468	I	***6558	IV$_a$
6375	I	6469	I	6559	IV$_a$
6376	III	6470	I	6561	I, III
6378	IV$_b$	6471	IV	6560	III
6379	IV, I	6472	IV	6562	
6385	IV$_b$	6480	I	6566	I
*6386	IV$_a$	*6481	I	6567	III$_a$
6394	II	6484	I	****6572	I
6395	I	6488	I	6573	I
6399	I	*6489	IV$_a$	6574	I, IV$_b$
6401	IV$_a$, IV$_b$	6497	I, IV	*6577	IV$_a$
6402	I	6498	I	6578	I
6404	I	6500	I	6579	IV

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TABLE III.

Showing the proportion of Spot-groups which showed D_3 as a dark line.

Month.	No. of Days of Observation.	Total No. of Groups observed.	No. of Groups in which D_3 dark.	Percentages.
January	5	15	4	26·6
February	11	15	4	26·6
March	12	10	7	70·0
April	17	22	10	45·4
May	4	13	6	46·1
June	3	4	1	25·0
July	7	14	4	28·5
August	12	26	7	27·0
September	1	—	—	—
October	9	11	1	10·0
November	6	9	3	33·3
December	1	5	1	20·0
				Percent. on the Totals
Totals	88	144	48	33·3

Aldershot:
1909 *April* 13.

[*Note added by the Rev. A. L. Cortie, S.J.*]

Captain Daunt has again courteously submitted his paper and his note-book of observations for my perusal in order that the opportunity may be afforded me of adding a note to the above tables. As in the observations of the reversal of D_3 made in 1907, so in those of 1908 the reversals have for the most part taken place in the earlier or disturbed periods of the life-histories of the spots. At the same time there is a fair percentage of round regular spots in Table I. in which the phenomenon has been noted. It must be remembered, however, that this type of spot was very prevalent in the year 1908, much more so than in 1907. In Table II., which contains the groups in which the phenomenon was absent, the spots were generally small or in the last stages of their life-histories. The larger groups in this table were round, regular spots of Type IV. Nevertheless, one group, 6480, though of short life showed considerable activity. In the life-histories of spot-groups the active stages are represented by Type I. when a few scattered dots appear amid bright condensed faculæ, Type II. when these scattered dots begin to coalesce into two main spots, and

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Type III., the most active phase, when the area contained between these two main spots is filled with detached smaller spots, generally surrounded by considerable patches of penumbræ. This phase generally supervenes between 5 and 7 days after the birth of the spot (*Astrophysical Journal*, vol. xiii. p. 262), and it is noteworthy that the area between the two main spots of a typical group is that which visually shows the greatest disturbance. Both in the observations of 1907 (*Monthly Notices*, vol. lxviii., 8, p. 625) and in those of 1908 the seat of the dark reversals of D_3, and the accompanying bright reversals and distortions of H_α, was precisely in this area between the two main spots, or in the region following the leading spot, when that stage had been reached in the development of a group where the following spot of the group had been absorbed. Notable examples were the groups 6393, 6489, 6490, 6491, 6494, and 6564, in the observations of 1908. In his paper on "The Distribution of Eruptive Prominences on the Solar Disk" (*Astrophysical Journal*, vol. xxviii. p. 253), Mr. Philip Fox points out that the brilliant eruptions of calcium and hydrogen flocculi shown in spectroheliograms in the neighbourhood of spots also take their origin in these regions. Captain Daunt's notes contain several observations of dark flocculi on the H_α line in the same regions. The region therefore of the greatest activity in the development of a sun-spot group lies between the two main spots of the group. It is probably due to the swirling in of the photospheric matter, with the consequent disturbances in the upper flocculous and chromospheric levels, between the cooled, dark, raised masses of metallic vapours which are represented by the umbræ of the two main spots of the groups. The very lie of the detached small umbræ and penumbral masses between the two spots, which gradually arrange themselves into approximate parallelism with the Sun's equator, visually suggests the swirl.

In the column of percentages of Table III. a great increase is shown in the numbers between January and March. Though the activity of the spots, allowing for the imperfection of the record, increased so far as D_3 absorption effects were concerned, there was a general decline both in the number and areas of the spot-groups. But the diurnal range of the declination magnet increased in the same period. The coincidence may be merely fortuitous, but is worthy of record.

Stonyhurst College Observatory:
April 17, 1909.

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Note on the Solar Constant and the Apparent Temperature of the Sun. By M. C. Féry, D.Sc.

(*Communicated by Sir David Gill, K.C.B., F.R.S.*)

The *Solar Constant* is the quantity of heat received by the Earth in calories per sq. cm. per minute, correction being made for the atmospheric absorption.

The *Apparent Temperature* of the Sun is that which a perfectly black body would have, which produced the same intensity of radiation, with the same apparent diameter as the Sun.

It is unnecessary to insist upon the importance of the determination of the solar constant; it is from the Sun that we derive, more or less directly, all the various forms of energy that we see transformed around us. Hence we have a large number of different types of actinometers which aim at measuring the solar constant or recording its variations. In principle they all contain a body exposed to the radiation, and which is termed the *receiver*, this body being covered with a substance of high absorbing power. Differences in detail exist in the mode of measuring the energy absorbed by the receiver. In those instruments which may be termed *calorimetric*, the rise of temperature of the receiver, of which the mass and specific heat are known, enables the energy received to be easily calculated (Pouillet, Violle, etc.).

In the more recent, so-called, *compensation* actinometers, the idea has been to balance the effect of the solar radiation falling on one of the junctions of a thermopile by an electric current, which imparts to the other junction a definitely known number of watts (Knut Ångström).

Measurement of the Solar Constant.

One of the greatest difficulties in this measurement lies in the evaluation of the atmospheric absorption. It is in fact to the doubt which exists as to the value of this correction that we may attribute the greater part of the enormous range ($A = 1{\cdot}5$ to 4) obtained in the measurements. The general consensus of opinion at the present day is in favour of taking A as 2·4.

Measurement of the Solar Temperature.

Before the exact law of radiation was known, observers were content to extrapolate various formulæ for evaluating the temperature of the Sun. Terrestrial measurements made for determining the coefficients in these formulæ rarely dealt with temperatures exceeding 1000° C. It is not astonishing, therefore, that inexact formulæ extrapolated from these low temperatures gave rise to values varying between 1500° and several millions of degrees.

It is, however, the figures above the probable mean apparent